

WHAT IS CLAIMED IS:

1. In an air motor of the expansible chamber type comprising an air cylinder, a piston reciprocable therein, a valve mechanism shiftable alternately to effect supply of air to and venting of air from opposite sides of the piston to reciprocate the piston, and a runaway control operable on increase in speed of
- 5 the air motor above a speed limit to stop the motor, said control comprising a pressure-responsive mechanism comprising an air chamber for air under pressure, a movable mechanism movable away from a first position in response to increase in air pressure in said chamber above a predetermined pressure limit to a second position, and movable back to said first position on reduction of
- 10 pressure in said chamber below said pressure limit, said movable mechanism when in its first position enabling operation of the air motor and when in its second position cutting off the operation of the motor, an air pump interconnected with the motor for operation simultaneously with the motor for delivering air under pressure to the chamber at a rate related to the speed of the motor, wherein the
- 15 improvement comprises:
- a bleed mechanism for bleeding air from the chamber at a controlled rate, the pressure in the chamber being controlled by the rate of delivery of air under pressure to the chamber and the bleed of air from the chamber, whereby on increase in speed of the motor above said speed limit, the pump, operating at

20 increased speed, delivers air under pressure at an increased rate to said chamber  
over and above the capability of the bleed to bleed off the increase, and on  
ensuing increase in air pressure in the chamber above said pressure limit, said  
movable mechanism moves to its said second position to cut off the motor;  
said bleed mechanism comprising a plurality of bleed flow paths of  
25 different lengths providing varying resistance to the flow of air, each bleed flow  
path having an inlet communicating with the chamber and an outlet, and a bleed  
path selector mechanism movable between a plurality of different settings  
corresponding to said plurality of different flow paths, said bleed path selector  
mechanism communicating in each of said settings with the outlet of one of said  
30 bleed flow paths and allowing said bleed flow path to vent for bleeding air from  
the chamber while sealing the outlets of the other bleed flow paths, whereby the  
speed limit at which motor cuts off can be adjusted by moving the selector  
mechanism to the desired setting.

2. The improvement to an air motor as set forth in claim 1 wherein  
said flow paths are connected in series.

3. The improvement to an air motor as set forth in claim 2 wherein  
said connected flow paths form a tortuous path, said outlets being at locations  
spaced along said tortuous path.

4. The improvement to an air motor as set forth in claim 1 wherein said bleed mechanism comprises a plate having channels therein forming said flow paths.

5. The improvement to an air motor as set forth in claim 1 wherein said channels are formed by one or more sinuous grooves formed in a face of said plate, said outlets being at locations along said one or more sinuous grooves.

6. The improvement to an air motor as set forth in claim 5 wherein said one or more sinuous grooves are formed by a single continuous groove having said outlets spaced at locations along the groove.

7. The improvement to an air motor as set forth in claim 5 wherein said bleed mechanism further comprises a gasket in sealing face-to-face engagement with said plate to close an open side of the grooving.

8. The improvement to an air motor as set forth in claim 1 wherein said bleed flow path selector mechanism comprises a plurality of valve members movable between closed positions in which they are seated in respective outlets to seal the outlets and open positions to permit airflow through the outlets, and a selector device for holding the valve members in their closed positions, said

selector device being movable to select a desired setting corresponding to a specific speed limit and being configured such that when it is the selected setting, the valve member corresponding to said setting is adapted to open while the other valve members remain closed.

9. The improvement to an air motor as set forth in claim 8 wherein the selector device is rotatable.

10. A bleed system for venting pressurized gas from a chamber to a vent opening at a selectively adjustable flow rate to control change of pressure in the chamber, the bleed system comprising:

at least two passageways each adapted for venting gas from the chamber and thereby tending to reduce gas pressure in the chamber, each of said at least two passageways having a length; and

a selector mechanism adapted for establishing fluid communication between the chamber and vent opening via a selected one of said passageways such that gas is vented from the chamber through the selected passageway to the vent opening;

said at least two passageways having different lengths such that selection of one passageway results in flow of gas from the chamber to the vent opening at one flow rate and selection of the other passageway results in flow of gas from the chamber to the vent opening at a different flow rate.

11. A bleed system as set forth in claim 10 wherein each passageway comprises a channel formed in a plate.

12. A bleed system as set forth in claim 11 wherein all passageways are formed in the same plate.

13. A bleed system as set forth in claim 12 wherein the passageways are connected in series.

14. A bleed system as set forth in claim 10 wherein each passageway has a generally uniform cross-sectional flow area along its entire length.

15. A bleed system as set forth in claim 14 wherein all passageways have substantially the same cross-sectional flow area.

16. A runaway motor control system for an air motor, the control system comprising:

a pressure-responsive mechanism operable on increase in speed of the air motor above a speed limit to stop the motor, said mechanism comprising an air chamber for air under pressure, a movable mechanism movable away from a first position in response to increase in air pressure in said chamber above a

predetermined pressure limit to a second position, and movable back to said first position on reduction of pressure in said chamber below said pressure limit, said movable mechanism when in its first position enabling operation of the air motor and when in its second position cutting off the operation of the motor, an air pump interconnected with the motor for operation simultaneously with the motor for delivering air under pressure to the chamber at a rate related to the speed of the motor;

a bleed mechanism for bleeding air from the chamber at a controlled rate, the pressure in the chamber being controlled by the rate of delivery of air under pressure to the chamber and the bleed of air from the chamber, whereby on increase in speed of the motor above said speed limit, the pump, operating at increased speed, delivers air under pressure at an increased rate to said chamber over and above the capability of the bleed to bleed off the increase, and on ensuing increase in air pressure in the chamber above said pressure limit, said movable mechanism moves to its said second position to cut off the motor;

said bleed mechanism comprising a plate having a series of channels in a face thereof providing bleed flow paths of varying resistance to the flow of air.

17. A runaway motor control system as set forth in claim 16 wherein each bleed flow path has an inlet communicating with the chamber and an outlet, and further comprising a bleed path selector mechanism movable between a

5 plurality of different settings corresponding to said plurality of different flow paths,  
said bleed path selector mechanism communicating in each of said settings with  
the outlet of one bleed flow path and allowing said bleed flow path to vent for  
bleeding air from the chamber while sealing the outlets of the other flow paths,  
whereby the speed limit at which motor cuts off can be adjusted by moving the  
selector mechanism to the desired setting.

18. A bleed system for venting pressurized gas from a chamber to  
a vent opening at a selectively adjustable flow rate to control change of pressure  
in the chamber, the bleed system comprising:

5 a passageway establishing fluid communication between the  
chamber and vent opening for venting gas from the chamber and thereby tending  
to reduce gas pressure in the chamber, the passageway having an inlet, an  
outlet, and a flow path extending between the inlet and the outlet;

an adjustment mechanism for selectively adjusting a length of the  
path to change a rate of flow of gas from the chamber to the vent opening.

19. A bleed system as set forth in claim 18 wherein the adjustment  
mechanism comprises a piston movable in a bore.

20. A bleed system as set forth in claim 19 wherein the passageway  
is defined by an annular gap between the piston and the bore.

21. A bleed system as set forth in claim 18 wherein the adjustment mechanism comprises a screw threaded in a bore.

22. A bleed system as set forth in claim 21 wherein the passageway is defined at least in part by a helical path along threads of the screw disposed in said bore.

23. A bleed system for venting pressurized gas from a chamber to a vent opening at a selectively adjustable flow rate to control change of pressure in the chamber, the bleed system comprising:

5 a passageway establishing fluid communication between the chamber and vent opening for venting gas from the chamber and thereby tending to reduce gas pressure in the chamber;

an adjustment mechanism for selectively adjusting a size of the passageway to change a rate of flow of gas from the chamber to the vent opening;

10 wherein the adjustment mechanism comprises a conical plug movable within a conically-shaped bore.